

STRENGTHENING OUR NATION'S **Workforce**

with
Demand-Driven
Solutions

eta

Office of Apprenticeship Training
Employer and Labor Services (OATELS)
Anthony Swoope, Administrator

Employment and Training Administration
United States Department of Labor



**Registered
Apprenticeship
Trends in
ADVANCED
MANUFACTURING**

Registered Apprenticeship In Advanced Manufacturing



Registered Apprenticeship training plays an important role in developing skilled workers. With the combination of on-the-job learning, related instruction, mentoring, and incremental wage increases, the apprenticeship model can be an effective system for addressing human resource issues and skill shortages that many industries/businesses face. Registered Apprenticeship can provide the expertise and knowledge individuals need to do their jobs effectively and advance in their careers.

Twenty-first century apprenticeship allows for a flexible competency-based training strategy that enables apprentices to move through a program at their own pace, benchmark the achievement of each set of core competencies and build a portfolio of skills and interim credentials that validate the acquired skill levels. Additionally, the related instruction is articulated with many two- and four-year colleges, allowing apprentices to work toward a degree. This is good news for the manufacturing industry because it meets many of their human resources and skills training needs.

The U.S. manufacturing sector faces a very difficult challenge: how to keep production here in the U.S. and still be competitive in the global market. The National Institute for Metalworking Skills (NIMS) has developed an innovative, competency-based apprentice-

ship training model that addresses training for the skills workers need to do their jobs well. NIMS is working with some 25 manufacturers nationwide to test the model. So far, manufacturers are finding that the program is greatly improving retention, on-time delivery, and productivity.

The Registered Apprenticeship model has proven its ability to address these and other issues in other industries and should become part of the human resources and training strategy for advanced manufacturing. The model offers an efficient, flexible training system that is responsive to new technology to keep workers up-to-date on skills they need to do their jobs.

The U.S. Department of Labor (DOL), Employment and Training Administration (ETA), Office of Apprenticeship Training, Employer and Labor Services (OATELS) has made a strategic decision to introduce the model to advanced manufacturing. "Advancing the Apprenticeship System" is one of the department's key initiatives, with investments of more than \$12 million to fund apprenticeship programs in new industries through the President's High Growth Jobs Training Initiative. They include:

- Health Care
- Advanced Manufacturing
- Information Technology

- Maritime Trades - Transportation
- Military - Indiana National Guard
- Geospatial Technology

The following case study looks at early results of investments and marketing efforts in advanced manufacturing. Even though the project is young, there are promising trends that point to the value of apprenticeship:

Benefits to Employers

- Greater competence of employees
- Reduced turnover rates
- Greater employee retention
- Lower investment in recruitment
- Higher productivity
- Improved quality of products and services
- More diverse workforce

Benefits to Apprentices

- Nationally recognized and portable certificates
- Improved skills and competencies
- Increased wages as a result of mastered competencies
- Ability to advance in career
- Higher self-esteem based on enhanced skills and certifications

Industry: **ADVANCED MANUFACTURING**

Competency-based Training and Recognized Standards Increase Competitiveness

The nation's vast advanced manufacturing industry is expected to add about 188,000 new jobs between 2002 and 2012; most will be in metalworking.

- Seven of 11 advanced manufacturing occupations expected to grow during 2002-2012 are in metalworking, including: industrial engineers (11%), computer-controlled machine tool operators (9%), engineering managers (9%), industrial engineering technicians (9%), machinists (8%, projected to produce the largest number of jobs), industrial production managers (8%), and industrial machining mechanics (6%).
- Skilled worker shortages and technological advances will lead to demand for metalworkers in areas such as computer-control programmers and operators, welders, cutters, solderers, brazers, and machinists.
- Manufacturing salaries and benefits average \$54K. Salaries range from \$29K for computer-controlled machine tool operators to \$90K for engineering managers.
- Most jobs in metalworking require long-term to moderate on-the-job training, but engineering and management positions require four-year college degrees.

Sources:
- Bureau of Labor Statistics, 2004
- Keeping America Competitive: How a Talent Shortage Threatens U.S. Manufacturing, a report from the Center for Workforce Success, 2004

Project Overview

DOL awarded the National Institute for Metalworking Skills (NIMS), based in Fairfax, Virginia, a two-year grant, which began in 2003. The grant's purpose was to further development of a competency-based Registered Apprenticeship system within the industry. By early 2005, NIMS was testing new curriculum materials for eight targeted occupations at 24 pilot training sites.

Created by the major metalworking trade associations in 1995 as a nonprofit educational organization, NIMS has the mission of developing a set of industry-driven national skill standards that set a benchmark for competency in the metalworking industry. After developing standards, NIMS identified specific competencies required to attain different skills and skill levels.

The next step was to develop a competency-based training curriculum for specific skill sets related to metalworking occupations and to pilot the curriculum at selected training sites. Throughout the development process, NIMS has worked closely with an expert panel that represents metalworking

companies and trade associations.

The panel selected eight occupations and associated core competencies to target for the pilot project.

Over the past 20 years, the nation's metalworking industry has experienced a massive transition from manually operated machines to computer numerically controlled (CNC) machines. This transition has demanded that both new and existing workers be trained on the CNC machines. Although many metalworkers receive introductory training to machining and metalworking through high school or postsecondary programs before entering the workforce, most training occurs on the job.



NIMS currently offers 46 credentials for various skill sets needed for manual and CNC machining, metal forming, stamping, press brake, slide forming, screw machining, machine building, and machine main-

tenance. Additional credentials are under development. According to NIMS staff, increased use of the competency-based Registered Apprenticeship training model will help establish unified skill standards throughout the industry.

The NIMS training system uses a career lattice that allows for cross-lateral movement across occupations and skill sets, as well as for progress to higher levels of competency in the same occupation. The expert panel also is working with NIMS to develop a series of Career Webs to illustrate the specific, and often overlapping, skill sets related to the industry's four major occupational areas: machining; metalforming; tool, die and mold-making; and machine building and maintenance occupations.

Using feedback from pilot sites, curriculum guides will be completed and readied for use in 2005. Given strong backing by the industry, NIMS staff expect that implementation of competency-based Registered Apprenticeship training programs will continue long past the end of the DOL grant.



Plans are being made to develop competency-based training curricula for additional occupations within the metalworking industry.

The primary workforce need in the metalworking indus-

try is finding qualified new workers with strong math skills and adequate soft skills who are willing to train for high-tech occupations in machining and metal forming. NIMS staff anticipate that use of a competency-based Registered Apprenticeship model will help attract and retain qualified workers; increase productivity, quality, and customer satisfaction; and give employers a better return on investment.

Role of Registered Apprenticeship

Support from apprenticeship representatives from both federal and local governments (SAC and OATELS staff) has been crucial to the NIMS competency-based training effort, according to NIMS staff. Their involvement, staff members said, has given NIMS increased credibility as the NIMS staff has reached out to new companies that might adopt the Registered Apprenticeship training model.

National and local apprenticeship staff are expected to play a major role in implementation of competency-based

Workforce Challenges

State workforce professionals and senior executives within the metalworking industry identified the following workforce challenges:

Recruitment and Retention

- Anticipated loss of 76 million manufacturing industry workers to retirement over the next 20 years
- Few qualified new workers willing to train for high-tech occupations in machining and metal forming
- Negative attitudes about manufacturing as a physically hard and dirty job
- Insufficient marketing to dislocated workers

Education and Training

- Increased need for high-tech training
- Few educational institutions willing to provide modular training to small classes at flexible hours and locations on an as-needed basis
- Increased desire of workers to receive college credit for training completed
- Insufficient sources of effective online learning options

Workforce Diversity

- Limited access to high-tech training for individuals with limited English skills
- Insufficient marketing of career opportunities to youth, young adults, women, and minorities

Registered Apprenticeship training throughout the industry, following training sessions scheduled for spring 2005. Following the sessions, the apprenticeship representatives will be equipped to share their knowledge about implementation of the training model in the metalworking industry with local employers and trade associations.

Employers and other industry stakeholders said they are finding that bright young job seekers are attracted to Registered Apprenticeship programs. That is because competency-based Registered Apprenticeship allows them to train on the job, progress at their own speed, earn college credit, achieve nationally recognized credentials, and become eligible for wage increases at a faster rate than with typical time-based apprenticeship programs.

Dislocated workers with experience in manufacturing are also attracted to companies that recognize previously acquired skills through credentials and offer them a chance to demonstrate their skills through a competency-based program. Likewise, existing workers are responding well to the opportunity to gain added credentials and increase their standing in the company, according to NIMS staff members.

NIMS staff members expect that competency-based Registered Apprenticeship training will increase the retention of employees because apprenticeship encourages them to take personal responsibility for their own career paths. Having a career lattice and required competencies helps workers plan a path toward credentialing and to select additional skill sets they would like to attain.

Providing workers the opportunity to progress at their own rate allows them to find a level of study and work that feels good to them, according to employers. If workers receive recognition for hard work through national credentials and earn wage increases, they are more likely to be satisfied at work and remain with the company. One employer noted that the turnover rate at his company has been



almost nonexistent after he implemented a Registered Apprenticeship several years ago. The employer said he expects this pattern of retention to continue under a competency-based system.

Human resources personnel said they anticipate that the widespread use of NIMS credentials will make the recruitment process more efficient because employers will know an individual's skills before hiring. In addition, competency lists can be used to describe specific skills needed for a particular job opening, which will help service providers who refer potential new hires.

Role of Educational and Training Organizations

Community colleges are finding ways to meet employer needs by providing instruction at flexible times and convenient locations. The use of defined national competencies makes it easier for schools to align their course credit requirements with the NIMS curriculum; therefore, more schools are willing to grant college credit for Registered Apprenticeship-related instruction.

Colleges and other training vendors participating in the project were:

- Butler County Community College (PA)
- Penn State University (New Kensington campus)
- College of DuPage (IL)
- Tooling University (online training)
- New Century Careers (PA)

All related instruction for Oberg Industries apprentices is held on site with curriculum provided by community colleges or specialized vendors. Apprentices have the option of taking job-related courses at Butler County Community College, for which the employer will pay. Vendor-provided, online learning is available during the workday in the company's computer lab.

Employer Profile

Camcraft, Inc., a precision-machined component manufacturer, has been in business since 1950. Located in an 85,000-square-foot facility in Hanover Park, Illinois, since 1994, Camcraft employs more than 200 full-time men and women. A family-owned business, Camcraft tries to maintain a supportive, family-oriented company atmosphere.

According to Patrick A. Bertsche, vice president of operations at Camcraft, the addition of Registered Apprenticeship and NIMS credentials to the company's training program have greatly improved retention, on-time delivery, quality measurements, cross training, and pride of workers in achieving goals.

Over time, he expects competency-based training to eliminate the disparity between different journey-level workers that exists with time-based apprenticeship. With the competency-based system, workers must demonstrate the same level of competencies before reaching journey-level status and receiving NIMS credentials. He said he looks forward to adding more occupations to the company's competency-based Registered Apprenticeship offerings.



Patrick A. Bertsche
Vice President of Operations
Camcraft, Inc.
Hanover Park, IL

Mr. Bertsche takes pride in the training program that Camcraft has developed, which includes core courses required of all employees whether they work in the business office or on the shop floor. The courses include entry-level information about safety, quality, blueprint reading, metrology, and people skills. Beyond the core courses, technical employees may take additional courses leading to a technical certificate, specialized technical certificate,

Registered Apprenticeship, associate in applied science degree, and/or a four-year college degree. Business employees also may take training that leads to a business certificate, advanced business/leadership certificate, associate in arts or general studies degree, and/or a four-year college degree.

He has seen real excitement about the training program from Camcraft's customers. They seem pleased to be in business with a company that invests so much in employee training. They also respect the professionalism and expertise of Camcraft employees and their quality of work.

Participating Employer Sponsors:

- Admiral Tool & Manufacturing Co. (Chicago)
- Alcon Manufacturing (Sinking Spring, PA)
- Buhrke Industries (Arlington Heights, IL)
- Camcraft, Inc. (Hanover Park, IL)
- Criterion Tool & Die (Brook Park, OH)
- Danly IEM (Cleveland)
- Elray Manufacturing Co. (Glassboro, NJ)
- GMT Corp. (Waverly, IA)
- Hydromat (St. Louis)
- Inland Technologies (Fontana, CA)
- Jergens (Cleveland)
- McNally Industries (Grantsburg, WI)
- Metric Machining & Subsidiaries (Ontario, CA)
- Morgal Machine Tool Co. (Springfield, OH)
- Oberg Industries (Freeport, PA; Chandler, AZ)
- Olson International (Lombard, IL)
- Penn United Technology (Saxonburg, PA)
- Pittsburgh Chapter, National Tooling and Machining Assn. (Pittsburgh)
- P-K Tool & Manufacturing Co. (Chicago)
- ProMold (Cuyahoga Falls, OH)
- Southern Manufacturing Technologies (Tampa)
- Timken (Lebanon, NH; Canton, OH)

Apprenticeable Occupations Include:

- Machinist
- Tool and die maker
- Mold maker
- Machine builder
- Machine maintenance and service repair technician
- CNC specialist - milling
- CNC specialist - turning
- Press set-up and operation - stamping

Apprentice Profiles



Jim Jackson, an apprentice at Oberg Industries in Freeport, Pennsylvania, was a vocational technical school student before he was hired in summer 2002. He said he likes the competency-based apprenticeship approach because he gets to learn a greater range of skills by working in different job capacities. The variety keeps him from getting bored and also allows his supervisor to observe his skill level with various tasks and thus help assign him to the most-suitable work. Jim now works in the grinding department at Oberg. He said he likes the opportunity to learn at his own rate, which has made him eligible for frequent pay raises as he progresses through the competencies.



**Jim Jackson (top) and
Dustin Gray**

Apprentices
Oberg Industries
Freeport, PA

Another apprentice, Dustin Gray, was working in a restaurant when he learned about Oberg's Registered Apprenticeship program through his father's former employer. He applied for a position at Oberg because of the apprenticeship training and the higher wages. He now works in the punch and die department as a cylindrical grinder.

Before coming to Oberg, Dustin said he knew nothing about the metalworking industry, but has found the work both challenging and rewarding. At his previous job, he rarely got

more than 30 hours work each week, but at Oberg, he has taken on more responsibility and works 50 hours a week. He said he likes the competency-based Registered Apprenticeship program because it rewards hard work through wage increases based on how much of the program is completed. In addition, Dustin said, it offers the potential for cross training in other parts of the plant and provides opportunities for advancement within the company.

Near Chicago, Camcraft has developed a successful partnership with the College of DuPage (COD). All related instruction classes are provided on site in the Camcraft plant's training area. However, if an apprentice wants to take a particular class before it will be offered again at Camcraft, he or she may enroll in a class at COD and the employer will pay the fee. Courses can be counted toward college credit, if desired. COD also is testing use of online, web-assist courses.

At the national level, DOL is helping NIMS negotiate with a university to grant credit for related instruction that uses the NIMS curriculum. The agreement may motivate other colleges and universities to partner with metalworking Registered Apprenticeship training programs. Another important educational resource is the web-based training available through Tooling University (www.toolingu.com).

Role of Workforce Development System

NIMS has worked extensively with One-Stop career centers in different parts of the country and with state and local workforce investment boards (WIBs). NIMS staff said they hope that providing One-Stop staff members with clear competency-based requirements for jobs will improve the quality of candidates referred to companies. They also hope that offering national credentialing will attract motivated job seekers to manufacturing jobs.

In Pennsylvania, Oberg Industries has successfully developed a relationship with the county's One-Stop, called "CareerLink," which is now considered one of their best sources for new hires. In addition to providing job seekers access to manufacturing employers through job fairs, CareerLink staff members also conduct informal assessments of an individual's interests and abilities and try to match these with employer qualifications.



Preliminary Observations

Registered Apprenticeship, using the NIMS competency-based training model, addresses the workforce needs of the metalworking industry in many ways, including recruitment and retention, employee skills, and quality production, according to those who were interviewed. All partners apparently benefit, including employers, employees/apprentices, customers, trade associations, educational institutions, and the workforce development system.

Those who were interviewed said that the competency-based Registered Apprenticeship system offers standardization of skills across the industry, makes hiring practices more consistent based on a person's credentials, gives employers a better return on their investment, and motivates employees to work harder to achieve competency level skills.

Recruitment and retention:

Employers reported that new hires are attracted by the opportunity for faster advancement, quicker wage increases, national credentials, and the option of earning college credit. In addition, the written competencies assist human resource personnel in communicating with One-Stop career centers and other recruitment agencies concerning job requirements. One employer noted that the turnover rate at his company has been almost nonexistent since implementing Registered Apprenticeship.

Improved skill level, product quality and customer satisfaction:

The NIMS competency-based curriculum offers standardization of skills across the industry and motivates employees to work harder to achieve competency level skills, according to employers. Managers at Oberg Industries, for example, reported that since instituting Registered Apprenticeship two years ago, the company has developed a more streamlined production process, improved its record of on-time delivery, and doubled its rate of production.

Cost-effective method of training:

Employers noted that Registered Apprenticeship is a cost-effective training method, as it takes many apprentices less time to reach a level of competency. Employers anticipate that if more apprentices stay with the company after reaching journey-level competency, costs will be reduced further, as fewer new hires will need training.

Prepared by
**McNeil Research and
Evaluation Associates**
February 2005



McNeil Research Authors

Ed Miller
Nadia Libbus

McNeil Research Editorial Staff

Dwight Peebles
David Prickett
Peggy Richmond
Robert Stone-El

McNeil Research Design & Graphics

David Prickett

McNeil Research Contributors

Carlotta Joyner
Dan Kaczynski
Janice Johnston

Contributor

Steve Mandes (NIMS)

For More Information

Office of Apprenticeship Training,
Employer and Labor Services
Employment and Training Administration
U.S. Department of Labor

www.doleta.gov/atels_bat
202-693-3812

Advanced Manufacturing
www.nims-skills.org



U.S. Department of Labor
Employment and Training Administration
Office of Apprenticeship Training,
Employer and Labor Services
200 Constitution Avenue, NW
Washington, D.C. 20210

www.doleta.gov/atels_bat
1.877.872.5627